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GLOBAL HEALTH CRISIS: FINDING THE IMPERATIVE SOLUTIONS

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Abstract

The earth is currently the only known planet that is sure to sustain life, with no other heavenly body seeming feasible. We, the humans have been oblivious to this fact and carried out activities that have slowly created a situation that has left us staring at a future which poses issues that are detrimental to the sustainability of our own species. Various human acts have affected in ways that are not intelligible to the community. Although, the realisation started long ago, the measures definitely demand a constant scrutiny to make sure that they are well-equipped to stem the decline to an extent that recovery becomes possible. This paper attempts to gauge the enormity of the situation of health deterioration around the world and identify the causes for it. A discussion of the current initiatives has been done and the measures that require change have been identified based on how they have been faring. Suggestions, in the form of improved solutions based on the need of the hour and with a specific aim of human health improvement have been presented in a bid to utilise the slim possibility of a reversal of states.

Keywords: Trans-boundary, health consequences, institutionalised policies, enforcement regulation

Introduction

Human health is defined by the World Health Organization as a state of complete physical, mental and social well-being. Global health impact studies in today's time identify hundreds of sources of threat and assess and calculate the mortality figures for each of them. This leads to an unorganised approach for redress. Instead, some core issues need to be identified which are the most prevalent and lead to other highly specific issues relating to one of physical, mental and social well-being. Looking for the solutions of these core issues will also lead to remediation for a number of other issues emanating from these core issues and lead to overall improvement of human health. These core hazards range from the already well under concern

hazards like climate change and stratospheric ozone depletion to the relatively new and less recognised threats of chemical contamination.

These threats have both direct effects on humans as well as indirect effects in the form of other small-scale and specific issues arising from them. Recognition of the scale of influence of these problems requires a fresh perspective which takes into account the complexity of the network of earth systems and society.

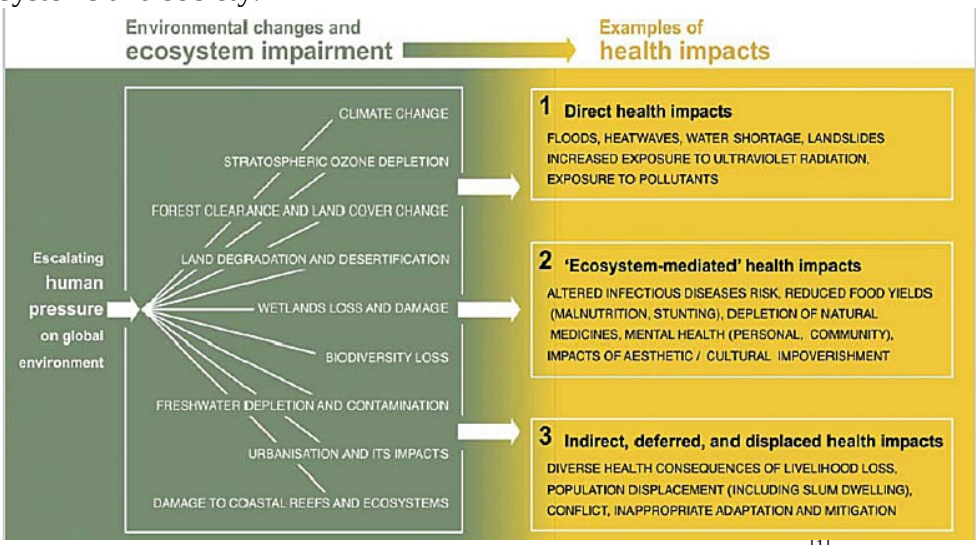

Fig.1: Harmful effects of ecosystem change on human health [1].

Some of the aforementioned factors have been discussed at length along with some issues which have remained unattended and which demand an increase in the recuperative measures. The sources of the creation of these issues and the consequential health problems have been identified and the measures have been analysed. Also, tips for possible improvements have been provided.

The global health issue - causes and current situation

The trends of growing exploitation of the biosphere leading to their declining condition is unsustainable and most likely irreversible, as it seems that we are on the cusp of crossing the threshold for reversibility. Reduction or complete abolition of the anthropogenic impacts is the only way to break this resilience.

"Health risks are no longer merely a result of localized exposures to "traditional" forms of pollution – although these still certainly exist. They are also a result of broader pressures on ecosystems, from depletion and degradation of freshwater resources, to the impacts of global climate change on natural disasters and agricultural production. Like more traditional risks, the harmful effects of the degradation of ecosystem services are being borne disproportionately by the poor.- LEE Jong-wook Former Director-General of World Health Organization"[1].

A large chunk of the population affected by these ecosystem changes is highly vulnerable and no longer capable of withstanding them further. They lack adequate safe water supplies and face declining agricultural yields and therefore are at the risk of malnutrition.

The factors range from climate change to wars and disasters etc. They have been discussed in detail further.

Factors responsible – their sources and effects

Climate change and greenhouse effect

Human produced greenhouse gases are the major culprit behind global warming. Anthropogenic sources amount to an annual 7.9 billion tonnes of carbon dioxide emission to the atmosphere [1]. The climate change thus induced leads to rising sea levels, increased temperatures and higher precipitation. In the last 100 years, the world has warmed by approximately 0.75^{o}C. Each of the last 3 decades has been successively warmer than any preceding decade since 1850[2]. Rising sea levels can make the salt water seep into the groundwater tables and mar the drinking supply. They can also displace populations from low-lying areas and displacement almost always goes hand in hand with poor basic living environment.

A constant climate is also a fundamental need for human sustainability, or for that matter, any species. Heat waves resulting from climate change can lead to heat related deaths. Beyond this, other risks include dwindling crop yield, droughts, and dry conditions or subsequently wildfires. Wildfires are a cause for deforestation and lesser trees relate to lesser absorption of the excess carbon dioxide in the atmosphere. Thus, fewer trees mean higher levels of greenhouse gases in the atmosphere which perpetuates the cycle in which temperatures keep increasing and wildfires occur. Global warming can also cause heavy rains and subsequent disasters in the form of floods and landslides.

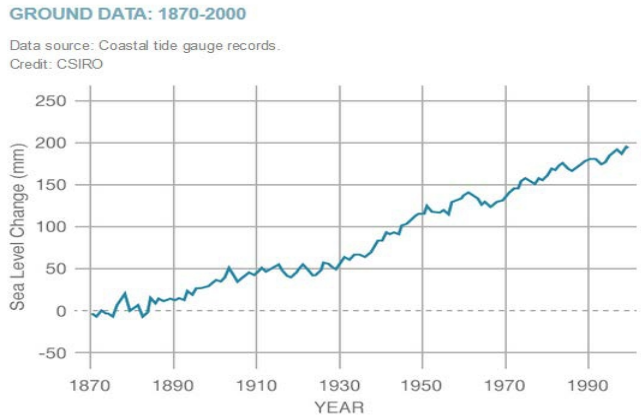

Fig. 3: Ground data for sea level change (Source: *climate.nasa.gov/vital-signs/sea-level*)

Deforestation and Desertification

Removal of trees and vegetation for various purposes leaves the land partially or completely exposed. The effects of this well-known process of deforestation on the ecological well-being of the earth are even better known. Local climate change because of CO_2 sinks lost and reduced resistance to floods and landslides are some of the consequences. It is a prime perpetrator of desertification which is the degradation of productive land to the extent that it no longer produces food or sustains life.

About 1 billion people are affected by land degradation created through soil erosion, waterlogging or increased salinity of irrigated land [1]. At present, Africa is the worst threatened continent with land degradation affecting almost 46% of the population. Asia lies at the crest of severity in terms of number of people affected [3].

Populations in these drylands are often marginalized and powerless in improving their well-being, which aggravates their vulnerability. They depend on the ecosystem for their basic needs, which take a toll due to the declining water availability and harsh climatic conditions. Agricultural productivity is lost. Wild plants that provide nutritional supplements are also lost and so is traditional medicine which relies on wild plants and is important when modern medicines are unavailable. Large dust clouds formed as a result are responsible for respiratory problems as far as thousand miles away. Women are heavily stressed to search for food, water and fuel till far-away places. Malnutrition becomes imminent in such situations. Infectious diseases also manifest owing to the lack of water for hygiene. The crisis forced use of heavily polluted water presents an enormous possibility of epidemics occurring.

Deforestation indirectly acts as the portent of infectious diseases. Reduction in the habitat of wild fauna modifies the ecosystem boundaries and shifts the vector breeding sites. Species lost due to this habitat destruction are the predators of these vectors. Proximity and contact with the vectors increases and diseases spread e.g. Malaria in Latin America, Nipah virus spread in Malaysia.

Ozone depletion and ultraviolet radiation

The ozone layer in the stratosphere provides shielding from the incoming solar ultraviolet radiation. Industrial halogenated chemicals like chlorofluorocarbons (CFCs, used in refrigeration, spray cans etc.) are inert at ambient temperatures but react with ozone in the extreme cold of the polar areas of stratosphere. According to the U.S. Environmental Protection Agency, one atom of chlorine can destroy more than a hundred thousand ozone molecules. The solar ultraviolet radiation photolytically destroys gases such as CFCs, methyl bromide and nitrous oxide and generates reactive “free

radicals" that again destroy the ozone. UV radiation has been found to be responsible for immune inhibition as well as skin cancer. Within the UV radiation band, the highest risk of skin cancer is from the UVB exposure. UVB contributes about 80% towards sunburn while UVA contributes 20% [4]. Other disorders attributed to UV radiation include cataracts and premature aging of the skin.

	DALYs (000)		Deaths	
Disease	**Upper estimate**	**Lower estimate**	**Upper estimate**	**Lower estimate**
CMM	621.2	345.1	58 645	32 581
SCC of skin	82.7	59.1	9 474	6 767
BCC of skin	52.1	29.0	2 921	1 623
Solar keratoses	8.3	8.3	0	0
Sunburn	293.6	293.6	0	0
Cortical cataract	529.2	529.2	0	0
Pterygium	34.6	19.7	0	0
SCCC	1.7	1.2	0	0
RHL	68.3	34.1	0	0
Total	**1691.9**	**1319.4**	**71 039**	**40 970**
Total (excluding sunburn and RHL)	**1330.1**	**991.7**	**71 039**	**40 970**

CMM: Cutaneous malignant melanoma; SCC: Squamous cell carcinoma; BCC: Basal cell carcinoma; SCCC: Squamous cell carcinomas of the cornea and conjunctiva; RHL: Reactivation of herpes labialis

Fig. 2: Disease burden due to excessive UVR exposure, Disability-Adjusted Life Years (000) and deaths [5].

Acid Precipitation

Acid precipitation or acid rain as it is commonly known has recently cropped up as one of the serious environmental issues with significantly harmful effects on the freshwater and terrestrial ecosystems.

Sulfur and Nitrogen are the principal elements responsible for the harmful effects of acid rain. Despite natural sources of acid existing in the atmosphere, emissions of sulfur dioxide (SO_2) and nitrous oxide (N_2O) from electric utilities, burning fossil fuels, especially coal are the prime contributors to acid rain. These get converted to sulfuric acid and nitric acid in the atmosphere respectively and are carried by the winds for many miles, till precipitated. Volatile organic compounds (VOCs) form another class of causes. These carbon-containing chemicals easily vaporise. Examples include paint thinners, degreasers, and other solvents. Sulfur and nitrate emissions lead to the formation of small particles (PM2.5) which are too small to settle down and can go deep into the lungs or even bloodstream. Many species of fish are not able to survive in acidic water. Forest vegetation and soils are also affected. The trees' natural defences are weakened, making them more vulnerable. The nitrous acid deposits lead to excess nitrogen in the soil which may cause eutrophication leading to unwanted algae. Acid rain reacts with the soil aluminium to form aluminium sulfate or aluminium nitrate which are adversaries that can be absorbed by the trees.

Disasters

Apart from the usual known casualties of disasters, there are possibilities of chronic illnesses and psychological effects which do not just span the duration of the disaster.

Some direct effects of disasters include physical damage to hospitals, food shortages and disruption of water supply and sewerage systems. Moreover, the personnel involved in these may also be victimized, thus aggravating the public misery. Not only are these medical services essential for disaster victims but also for primary healthcare services needed perennially, including immunization.

The basic public infrastructure is damaged leading to disruption of basic living conditions. This is something that sets the foundation for infectious diseases to ensue and probably turn into an epidemic. Displacement of animals near human settlements brings in the threat of disease transmission from these animals.

Incidents have been reported where people don't follow the disaster management authorities' instructions and stick to their personal decisions which prove to be detrimental to themselves and the interests of the community. According to a study by the Japanese Government, during the 2011 tsunami, only 58 percent of people in Miyagi and Fukushima headed for higher ground immediately after the earthquake [6].

Wars & Conflicts

Armed conflicts involve destruction of families, communities or even entire cultures. The facilities meant for medical care and other health and social services are disrupted. People are forced to leave their homes and become internally displaced persons or refugees. The physical environment is degraded and a huge amount of non-renewable resources are used up in the preparation as well as during the war.

Since long, wars have had casualties in the form of not only armed personnel but civilians as well in large numbers. Armed violence is the fourth leading death cause for those between the ages of 15 and 44 worldwide [7]. Thus, a large blow is being dealt to the youth population. The majority of deaths occur due to non-conflict armed violence including small or large-scale criminally or politically motivated armed violence. The year 2004 alone, witnessed more than 490,000 homicides [7]. WHO estimated 0.70% of the global disease burden in 2000 to be due to conflict, including life years lost and those lived with disability [8].

The wealth of a nation is inversely related to the chances of having a civil war. According to past records, a country with a GDP per capita of US$250 has a 15% probability of war in the next five years where as

countries with per-capita income of more than US$5000 have less than a 1% probability[9].

The destruction of the societal setup, food and water supply systems, healthcare, sewage system, and power and communication systems forces large-scale migration. Malnutrition results and so do diseases which may also be infectious in nature and get aggravated owing to the poor hygiene facilities used by the displaced in the refugee camps. At least 200,000 people—and perhaps many thousands more have died each year in conflict zones from non-violent causes (such as malnutrition, dysentery, or other easily preventable diseases) that resulted from the effects of war on populations [7]. Water bodies, land and the air are polluted both during testing and during the war. People exposed to the smoke start suffering from respiratory ailments. Ionising radiation from the production, testing, use and disposal of nuclear and radioactive weapons are highly toxic. These along with the bioweapons which may be used to mar the human supplies through destruction of food and livestock, possess enormous possibility of making damage to the commoners throughout generations, however controlled their use may be. Even for the workers involved in the production, transport and storage of these weapons and the communities living nearby, there lies a huge risk. Wars also leave behind another great risk of hidden landmines which may cause damage years after things are over. Approximately 80 million landmines are still deployed worldwide in at least 78 countries [9].

Trans-boundary Movement of Hazardous Wastes

Over the years, as countries have become industrialized, there has been a spur in the amount of wastes, a significant part of which are hazardous. Alongside, concern has grown and stricter regulations for the handling of these wastes have come up. This has forced the developed countries to move towards the poor and developing countries for easy and unregulated ways for disposal. This has led to surfacing of much greater environmental concerns for the generally overpopulated poor countries where the disposal is carried out using improper procedures in small workshops. Organization for Economic Co-operation and Development (OECD) has put the estimate of movement at about 4 million tonnes per year, with not all being legitimate.

Landfills composing of these wastes lead to land degradation and water contamination. Incineration also contaminates the air and subsequently land and water through precipitation. The exact scale of the hazard is difficult to determine owing to indeterminacy of exact waste composition which may also have some lethal radioactive fraction. Also, the bacterial and viral content which may result in infectious diseases is difficult to determine. Countries have tried to specify what means hazardous to them and are trying

to control their spread. However the exact quantification needs to be done quickly as the effects may become a global concern, anytime soon.

Global Chemical Contamination

The by-products of industrialization and manufacturing pose hazardous risks to human health and the environment. Apart from sporadic cases of catastrophic contamination caused by industry, subtle impacts on human health owing to low levels of exposure are possible. The indispensable pesticide in agriculture on a long-term low dose can lead to various cancers, immune suppression, hormonal issues, birth defects, and developmental defects. The costs of injury from pesticide poisoning in 37 sub-Saharan African countries, due to lost work days, medical treatment and hospitalization amounted to USD 4.4 billion in 2005[10].

A by-product of manufacturing, dioxins can accumulate in fats and degrade over time. This contaminates the food chain. It belongs to a group of chemicals which are persistent organic pollutants (POPs), known as the "dirty-dozen". These do not degrade and remain in the environment and exert their effects. Consumer products today have benefits with side effects. The chemicals used in their production are harmful e.g. Bisphenol A (BPA) used in hard plastic bottles and metal cans. Pharmaceuticals, diagnostic equipment and other interventions are also probable contaminants. Medical waste incinerators are the largest source of anthropogenic emissions of mercury, a substance which can cause lifelong behavioural and cognitive issues or even cancer. The current world chemical output is estimated at 20 million metric tonnes by the UN Environment Programme, about a third of which is thought to be toxic or carcinogenic. The growth rate of this output is about 3% per year.

The harm which is dependent on the level and duration of exposure is mostly negligible but as these activities go on unchecked, the situation surely warrants attention.

Type of required measures

The whole global issue of human health requires a comprehensive approach aiming for development which is ecologically sustainable. Such an approach requires efforts from stakeholders across different sectors and to use the resources at their disposal in a perennially ecologically minded way.

Overall, the strategies expected from these stakeholders can be of various categories. Mitigation strategies which can reduce the effects of the underlying causes and improve the human health are desperately needed. The human diaspora also needs to adapt to the already occurring ill-effects of the change and devise new methods of quickly resurrecting itself against the loss in any major disaster, epidemic or other environmental change. These

aforementioned methods cannot be successful without integration with assessments of the suspected fore bearings of any human action, be it for the betterment of earth or not, followed by preparation of certain indicators for better management of the course of action. Global capacity-building initiatives are necessary and the knowledge thus acquired by the participants should be disseminated world over.

Present measures and desired future actions

Measures for addressal of each of the hazards are being separately thought out across the world and being put into action. Improvement has been a constant throughout the years and is the prime ingredient for enabling the efforts to considerably resurrect a healthy world.

The depletion of ozone layer is an issue which has been involved in climate change as well. The reconstitution of the ozone layer to its earlier state in 1980 will take some time. Reduction in the chemicals responsible is already in action through the force of laws. Abolishing manufacture and use of CFCs will be a shot in the arm. Being greenhouse gases, their removal will also arrest global warming and climate change. Technology for assessing the impact is being continually improved and can be shared across national boundaries. Satellites are a kind of technological tool which can be used for risk assessment and the richer countries should provide assistance to the poorer countries which are not capability of launching own space missions. The international organizations have a great role to play in development of greener development strategies. The UN-REDD programme is helping countries develop national strategies, financing approaches, and institutions that reduce emissions from deforestation and forest degradation to fight climate change.

Sustainable agricultural innovations are the key to successfully combating desertification. Traditional practices and local know-how can help a lot. Today, most measures try to check sand movement. Instead, they should be targeted at the root causes of land degradation such as overgrazing, unsustainable farming and deforestation.

For the case of hazardous wastes, conventions have been formed. The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal is one such convention. Formed in 1992, it currently has over 170 Parties. However, the regulations laid down by these conventions are not strictly adhered to. Trans-boundary travel of wastes should be properly scrutinised. False information on containers is a common ploy used by the defaulters. Moreover, countries that are not party to these conventions have almost no regulations in this regard. In such cases, illegal movement becomes rampant and without any trace which removes the possibility of punishment later on as well. Various disguises are used, such

as relief material for expired medicines and raw materials for waste chemicals. Different countries have different definitions for waste and this frequently, leaves the waste (asbestos, tyres etc.) lying without treatment and posing a hazard. A unified law with stricter enforcements and logical solutions for disagreements is the need of the hour. Waste should be transported only after ensuring that the importer has facilities for proper disposal. The documentation of each transaction should be more informative and complete for necessary legal actions and future studies. Long distance travel increases the risk of accidents during transit. Thus, development of disposal facilities in countries lacking these should be encouraged and assisted by international organizations. Countries need to develop mechanisms to prevent flow of any hazardous waste through their territory. The general public should encourage construction of waste disposal facilities and not protest against construction near their dwelling, as has been seen in various situations. Recycling and waste disposal facilities also help to create jobs. The economic benefits of the growing waste market should be carefully weighed against the health losses before making new laws for waste movement.

Organizations have been actively working to solve the problem of chemical contamination. The United Nations Industrial Development Organization (UNIDO) checks the use of chemicals through its Energy and Environment Programme . The Food and Agriculture Organization of the United Nations (FAO) has been actively working in the field of pesticides. The Stockholm Convention on Persistent Organic Pollutants, which entered into force in 2004, is a global treaty whose purpose is to safeguard human health and the environment from highly harmful chemicals that persist in the environment and affect the well-being of humans as well as wildlife [11]. Better research is required to address the issue of global chemical contamination. Knowledge of the pathways and the extent of circulation of contaminants followed by establishment of scientifically correct limits are necessary. Better knowledge of these pollutants can lead to identification of improvement areas and production and manufacturing in greener ways.

Civil registration systems are shut down in most wars hampering the quantification of the deaths due to natural reasons and those due to the war. Media reports have widely differing numbers and are unreliable. More reliable data through surveys and pre-war and post-war census can better identify the health effects of wars. Better forecasts of war can enable the public health sector to better prepare for refugees and other public health consequences. This will also lead to an informed foreign policy where in countries assess their loss beforehand and make decisions for the public good. As the best solution, international treaties should be ratified and pre-emptive war, like the one in Iraq, should be rejected. Though the prevention

of the onset of war is the best solution, but if war is unavoidable, extra care should be ensured for vulnerable groups such as women and children.

Epidemics are a probable consequence of almost all the hazards. There should open distribution of knowledge of infectants, their laboratory samples and known treatments. The authorities should ensure treatments and vaccines are equally accessible to all, across the geographical and economical strata. Nations should strengthen themselves to sense hazards and be prepared to efficiently tide over it. This, if requires help from other nations or other stakeholders of the society, should be helped with.

In the face of disasters, sources of emergency supplies should be ready and a rapid assessment of the damage should be done to identify the needs. If a shortage crops up, required assistance should be asked for. However, such donations must be ensured by the donor for being safe and best suited for the need. Relief supply should be free from political and social influence and equally available for all the affected people.

There should global cooperation between governments in the surveillance, alerting and the response procedures. This cooperation must incorporate organizations like the United Nations, private industries, professionals, academia, media and the civil society.

Collaboration across sectors is required. Health, agriculture, trade and tourism should be well-informed of others' decisions and should be careful in forecasting the results of their actions before actually acting. Agenda 21, the international action plan adopted in 1992 at the United Nations Conference on Environment and Development (Earth Summit) describes a comprehensive approach to ecologically sustainable development which incorporates cross-sectoral policies [1]. Proper labelling of multi-hazardous regions combined with preparedness for each of the hazard is necessary. The disaster mitigation systems can be installed during the reconstruction period for future prevention. There should be increased stress on creating global and national resources for the improvement of public health facilities, advancement of surveillance procedures, responsiveness of relief networks, and organisation of public education campaigns. The priorities should be set for redressing health issues through parameters such as DALYs and burden-of-disease and work done should have the included aim of reducing the health disparity and bring the whole population at an equal, acceptable state of health.

Conclusion

People and ecosystems are involved in a dynamic interaction growing at a rapid scale. Though there has been an expanding understanding of these issues, the near future of this linkage is clouded by complexity and uncertainty. The efforts made till date have been instrumental in the healing

process, e.g. As a result of various measures being taken, it is expected that the ozone layer will naturally heal in about 50 yrs. [12]. However, the threat is far from over. Quantification of the threat is the problem in most of the cases. Improved methods need to be discovered to determine the exact level of threat so that appropriate measures of the required level can be put in place. Humans are the receiving end in all the situations, suffering through epidemics, malnutrition, contamination etc. The impetus should be on improving basic health infrastructure and primary health and making the people capable to tide over health disasters. A host of measures with an all-inclusive approach and a clear aim of improvement of human health and the environment are the need of the hour to preserve the 'most intelligent' species on earth for ages on.

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